

## SPRING SHOREBIRD MIGRATION THROUGH CENTRAL VENEZUELA

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**ABSTRACT.**—Nearctic-breeding shorebirds regularly migrate through the llanos of central Venezuela in the spring (March–May). At a single site, consisting of three feeding areas with a total of 3–5 ha, 10 species were recorded. Four migrating Least Sandpipers (*Calidris minutilla*) banded at this site were recaptured there in subsequent years. White-rumped Sandpipers (*C. fuscicollis*) dyed and flagged in the Venezuelan llanos were observed a few weeks later, one in Texas and two in Kansas. Shorebird weights, numbers, passage times, and lengths of stay at the study site are given. Nearly all shorebirds had recently completed molt of remiges and rectrices, but none were in distinctive breeding plumages or colors. Received 27 Jan. 1987, accepted 4 June 1987.

Although shorebird migration routes are relatively well known in North America, their passage routes in South America, where most species spend over half of their lives, are poorly understood. Recently, interest has increased in the welfare of migrant nearctic-breeding shorebirds because feeding and resting sites are limited and declining in both number and quality (Myers 1983, Senner and Howe 1984).

I briefly sampled spring shorebirds on migration at a single site in 1982 and 1983. In 1983 I recaptured one of the 21 Least Sandpipers (*Calidris minutilla*) banded in the previous year. Because of this I decided to study in detail shorebird passage in 1984. Here, I give data on species, passage times, numbers, weights, molt, length of stay, and returns.

### STUDY AREA AND METHODS

The site of most observations and all mist-netting was a 4000-ha cattle ranch, Fundo Pecuario Masaguaral, approximately central in the llanos of Venezuela (08°31'N, 67°35'W). A description of the vegetation of this ranch is in Troth (1979). Masaguaral, 45 km south of Calabozo in the state of Guárico, is about 240 km inland from the nearest maritime shore on the Caribbean Sea and separated from it by the Coastal Range of mountains. The llanos, covering much of the center of Venezuela (approximately 200,000 km<sup>2</sup>), are natural grassland savannas, intersected by large, broad rivers such as the rios Orinoco, Portuguesa, Apure, and Meta. A similar-sized savanna with generally the same edaphic conditions lies to the southwest in Columbia (Huber 1974). The savannas of both countries, (2°–10°N, 30–200 m elevations) are hot with small annual temperature variation. The year is roughly divided into wet and dry seasons.

On Masaguaral three deep-well pumps run continuously throughout the dry season to keep two marshes and one lagoon wet for wildlife. Shorebirds used a maximum of only 5 ha, because the marshes varied in size within and between years, and much of the lagoon

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edge was unsuitable for them. I mist-netted at one 1.5 ha marsh and at the 3 ha lagoon area. Most netting was done in the early morning and late afternoon to avoid a strong wind from 09:00 to 16:00 in the dry season. I worked on 6 days in April and early May in 1982 (60 mist-net hours), and 6 days in April 1983 (134 mnh). During 1984 I netted shorebirds on 44 days (912 mnh) from 20 March–19 May, covering the principal time of shorebird passage.

Captured birds received standard U.S.F.W.S. leg bands and after 23 April 1984, most were also marked with black plastic leg flags and picric acid dye on the right ventral surface, using guidelines of the Pan American Shorebird Program (Myers et al. 1983). Each bird was weighed to the nearest 0.1 g and 1 g respectively, using 50-g and 100-g Pesola spring balances which were checked for accuracy at least once a day. Most shorebirds were released within 20 min of capture.

I counted shorebirds at all three wet areas on the ranch to define their presence and numbers. Data were divided into 10-day periods each month (early, mid, and late). To compare the three most common species' abundance and timing, I used only those counts in 1984 from the 3 ha lagoon area, listing the single highest count on days when I made an early morning and late afternoon count. A few observations used from other years are noted.

Later I examined all of the 10 shorebird species found at the study site, in both the Colección Ornitológica Phelps, Caracas, and in the American Museum of Natural History, New York. My objective was to record all interior Venezuelan spring migration dates, sites, and abundance as represented in those collections.

## RESULTS

*Species, passage months, and numbers.*—I found 10 species of nearctic-breeding shorebirds at Masaguaral during northward migration: Greater Yellowlegs (*Tringa melanoleuca*), Lesser Yellowlegs (*T. flavipes*), Solitary Sandpiper (*T. solitaria*), Spotted Sandpiper (*Actitis macularia*), Semipalmated Sandpiper (*Calidris pusilla*), Least Sandpiper, White-rumped Sandpiper (*C. fuscicollis*), Pectoral Sandpiper (*C. melanotos*), Stilt Sandpiper (*C. himantopus*), and Buff-breasted Sandpiper (*Tryngites subruficollis*). Small numbers of four other shorebird species have been found in the eastern Venezuelan llanos (Phelps and Phelps 1958, Meyer de Schauensee and Phelps 1978), but I have never seen any of them on this ranch during 14 years of observations. Black-necked Stilts (*Himantopus mexicanus*), recorded on Masaguaral January–June (Thomas 1979), migrated through from early April through May in small numbers (maximum daily count 18). McNeil (1971) found them breeding in eastern Venezuela; thus there is no certainty that these individuals were not just making local movements, and I do not consider them further in this paper.

With the exception of fewer than 10 Solitary Sandpipers and 5 Spotted Sandpipers that usually spend the northern winter on the ranch each year (Thomas 1979), all other shorebirds and most Solitary and Spotted Sandpipers were transients; no shorebirds were ever found "summering" (McNeil 1970) on the ranch.

From 1982 to 1984 the pattern of migration was the same. The earliest

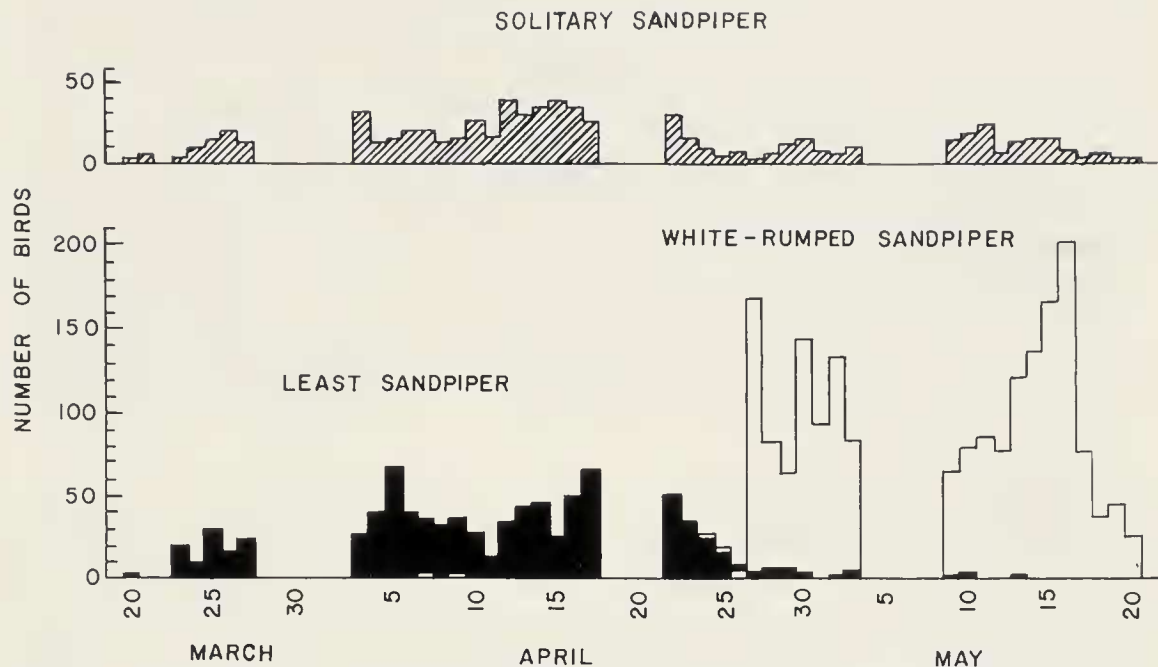


FIG. 1. Shorebird counts during northward migration in 1984 at a 3-ha artificially flooded site in the Venezuelan llanos.

arrivals were Greater Yellowlegs (maximum daily number = 2) from late February through early April. Lesser Yellowlegs passed from mid-March through mid-May, with peak daily numbers of 7 in early April. Transient Solitary Sandpipers appeared from late March to mid-May. Least Sandpipers and small numbers of Semipalmated Sandpipers passed through from late March to early May. A few White-rumped Sandpipers were seen in mid-April but most birds came through between late April to mid-May. Spotted Sandpiper migrants were last, passing through from late April to late May (maximum daily count in mid-May = 5). Three additional species were found in small numbers: Pectoral Sandpipers were present irregularly from mid-April to early May (maximum = 5); Stilt Sandpipers were present occasionally (1–4) between mid-April and mid-May (maximum = 4), with a flock of 19 on 20 April 1985. A single Buff-breasted Sandpiper was netted on 26 April 1983. The two most abundant species, Least and White-rumped sandpipers, overlapped only briefly (Fig. 1).

Least Sandpiper numbers, which were generally stable during the day-time, sometimes changed substantially overnight, suggesting fall-out of nocturnal migrants. White-rumped Sandpipers, however, appeared to pass over during daytime. On all eight days when I censused the birds early in the morning and late in the afternoon, White-rumped Sandpiper numbers had increased (9–44%). White-rumped Sandpiper also was the only



TABLE 1  
SHOREBIRD WEIGHTS AT FIRST CAPTURE (ALL YEARS COMBINED)

Species	Number captured	$\bar{x} \pm SD$ (range)
Lesser Yellowlegs	3	82.40 (74.0–93.0)
Solitary Sandpiper	104	48.40 $\pm$ 8.56 (31.1–65.1)
Spotted Sandpiper	11	37.12 $\pm$ 4.00 (32.9–46.0)
Semipalmated Sandpiper	19	24.46 $\pm$ 3.82 (18.2–31.2)
Least Sandpiper	276	23.20 $\pm$ 3.56 (16.0–34.0)
White-rumped Sandpiper	367	34.69 $\pm$ 4.55 (27.5–45.7)
Pectoral Sandpiper	3	53.00 (47.3–57.2)
Stilt Sandpiper	1	63.20
Buff-breasted Sandpiper	1	38.10

species that I saw leaving the study area diurnally in discrete flocks. These birds typically stopped feeding, rested in unusually tight flocks, then flew up together as a calling group, circled several times overhead, and departed north northwest (compass direction of approximately 330°).

*Weights and molt.*—There was a broad weight distribution in most species due to both sexual size dimorphism and migratory fat deposits (McNeil 1970, Prater et al. 1977, Johnsgard 1981, Dunning 1984) (Table 1). Weights of repeat birds of three species in 1984 ( $N = 39$ ) generally showed a gain, although some lost weight in the early days after initial capture and gained weight on longer stays (Table 2), much as Page and Middleton (1972) found in migrating Semipalmated Sandpipers at an Ontario stopover.

All birds were examined for molt. Most individuals of all species had new flight feathers and old (worn and fringed) dorsal contour feathers. Exceptions were birds that had not completed rectrix molt. I did not determine the ages of birds. No birds were in breeding colors such as the distinctive breeding plumage described by Blake (1977) for Stilt Sandpipers, and soft part colors for Spotted Sandpipers (Prater et al. 1977).

*Returns and sightings.*—Although only 75 Least Sandpipers were banded in 1982 and 1983, there were four returns (5%). Three returned one year later, less 2, 7, and 8 days from their original capture dates. The fourth Least Sandpiper returned two years plus 4 days after its first capture. One Least Sandpiper netted on 19 April 1982 had been banded as a juvenile 5 September 1981 in Westboro, Massachusetts.

I began dying and flagging shorebirds on 23 April 1984; thus most dyed birds were White-rumped Sandpipers (Fig. 1). Observers cooperating with the Pan American Shorebird Program reported three of these in North

TABLE 2

MEAN STOPOVER DURATION BETWEEN CAPTURES AND MEAN WEIGHT GAIN OF SHOREBIRDS  
IN THE VENEZUELAN LLANOS DURING SPRING MIGRATION 1984

Species (N)	Mean stopover time	Mean change in weight
Solitary Sandpiper (7)	$5.1 \pm 3.3$ (1-9) <sup>a</sup>	$0.64 \pm 2.6$ (-6.8-+8.6)
Least Sandpiper (21)	$11.2 \pm 8.4$ (1-31)	$2.89 \pm 3.5$ (-4.7-+9.9)
White-rumped Sandpiper (11)	$4.5 \pm 5.7$ (1-11)	$4.47 \pm 4.5$ (-2.1-+11.2)

<sup>a</sup> Mean number of days  $\pm$  SD (range).

America, in the same migratory season. One bird was seen on 14 May at San Angelo, Texas, and two others were seen on 23 May at Cheyenne Bottoms, Kansas. These birds were certainly from Masaguaral, because I was the only worker in Venezuela using dye and black flags on shorebirds that season.

## DISCUSSION

Site fidelity of nearctic shorebirds to migration stopover areas had been observed in Semipalmated and Western (*C. mauri*) sandpipers (French 1973), Spotted Sandpipers (McNeil 1982), Red Knots (*C. canutus*) (Harrington and Twitchell 1982), Sanderlings (*C. alba*), Ruddy Turnstones (*Arenaria interpres*) (Myers, unpubl. data), and Semipalmated Plovers (*Charadrius semipalmatus*) (Smith and Houghton 1984). This paper shows that Least Sandpipers share this characteristic behavior.

The time of spring shorebird passage (March-May) coincides with the end of the dry season when the llanos are usually parched and bare. In some years, however, due to the variable beginning of the annual rains (Thomas 1985), shorebirds are present during the earliest rains. The only extensive natural water during spring migration is along the rivers in large sandbars and a few mud flats. An additional, but unpredictable, source of shallow water is in newly created (since 1955) rice fields in the northern Venezuelan llanos. These fields were used by shorebirds occasionally when they were fallow and slightly irrigated for pasture, or immediately after rice seeding. In some years many hectares were available during shorebird passage, and in other years none had water at this time. Usually, however, the total of 3-5 ha of shorebird feeding habitat at Masaguaral is a tiny oasis in a vast and generally inhospitable habitat.

During the three years of the study, the order in which the different species stopped over at Masaguaral was consistent, even though the conditions of feeding sites varied. In 1982 the most heavily used area was a 1.5-ha shallow, clearwater pond flooded by water pumped over a field

which had suffered a grass fire four weeks before migration time. In 1983 and 1984 there was little or no water at this site, and the birds foraged mainly on 3 ha of mud flats 1.5 km away on the edge of a lagoon maintained in the dry season by pumped water. In 1985 heavy early rains left abundant shallow water throughout the llanos and fewer shorebirds stopped at Masaguaral during April–May. I believe this was because transient birds used natural foraging sites.

During the northern summer (July–September) no shorebirds stayed on the ranch, probably because at that time much of the land is flooded with seasonal water often too deep for foraging. The “summering” individuals that McNeil (1970) found at his northeastern coastal study area were there because the maritime shore remains hospitable throughout the year. A few early fall migrants occasionally stopped over briefly on Masaguaral (August–October) but numbers were low (5–10 birds), and they stayed less than a day, usually in years when low rainfall exposed a few mud foraging areas.

No previous studies have been made of inland migrating shorebirds in Venezuela, and H. Sick (pers. comm.) knows of no study from Brazil. Thus shorebird migration through interior continental South America is known from opportunistically observed or collected birds in museums. There were few birds from interior Venezuelan sites March–May in the two museum collections I examined (i.e., Least Sandpiper 3, 2 [first figure from the Colección Phelps, second from AMNH]; White-rumped 3, 1; Pectoral 1, 0; Stilt 0, 0; Buff-breasted 11, 4). All of the Buff-breasted Sandpipers in both collections were from the Territory Amazonas, 300–700 km south of my study site. The literature, which is based on museum collections (Phelps and Phelps 1958, Blake 1977, Meyer de Schauensee and Phelps 1978), does not suggest the extensive spring migration through Venezuela that I found.

Studies of nearctic shorebirds in South America have concentrated on discrete coastal areas of the continent (McNeil 1970, 1982; Spaans 1978; Myers and Myers 1979; Harrington et al. 1986). Although it is well known that vast numbers of shorebirds pass along the Mississippi flyway through continental North America (Johnsgard 1981), perhaps because there is no major north-south river valley in South America, interior migration on this continent has been largely ignored. Additional, long-term, study of interior South American shorebird migration will give a clearer understanding of the extent and importance of this migration route.

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**CENTENNIAL MEETING IN PHILADELPHIA, PENNSYLVANIA,  
9-12 JUNE, 1988**

The Wilson Ornithological Society will hold its Centennial Meeting from 9 to 12 June 1988 at Rosemont College in suburban Philadelphia, Pennsylvania. A three-day scientific program (one day more than customary) is scheduled, with contributed papers and symposia. Morning field trips are planned as well as day trips on Sunday, June 12. Tours of interest will be scheduled for non-ornithological spouses and guests. Centennial Day, including an international symposium on *Parus* and a gala reception, will be at the Academy of Natural Sciences of Philadelphia. The meeting announcement and call for papers will be mailed to members in early January, 1988. Queries may be directed to: WOS Local Committee, Department of Ornithology, Academy of Natural Sciences, 19th and The Parkway, Philadelphia, PA 19103.